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TECHNICAL ASSESSMENT OF
PSSC-SUPPORTED EXPERIMENTS AND DEMONSTRATIONS
FROM OCTOBER, 1977, THROUGH MARCH, 1978

ENGINEERING DEPARTMENT
PUBLIC SERVICE SATELLITE CONSORTIUM
2480 W. 26th Avenue, Suite 90B
Denver, Colorado 80211

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16. Abstract A study of long-term and short-term societal users of satellite technology, who are provided planning, coordination, and technical implementation support by the Public Service Satellite Consortium. The study, which covers the period from October, 1977, through March, 1978, focuses on the purposes, scope, and results of demonstrations and experiments.			
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PREFACE

OBJECTIVE

This report describes CTS and ATS short-term satellite demonstrations supported by the Public Service Satellite Consortium (PSSC), and long-term experiments which are supported through usage of the Denver, Colorado, satellite communications ground station complex. The period covered is from October, 1977, through March, 1978. Included in the report are:

- (1) a discussion of the objectives and goals intended;
- (2) a summary of user-assessments about the programmatic impact of their demonstrations and experiments;
- (3) a presentation of the technical planning/coordination process involved in satellite utilization; and
- (4) an assessment of the technical effectiveness of these PSSC-supported activities.

SCOPE OF WORK

The report of long-term experiments is a consolidation of:

- (1) documentation received from respective participants of each experiment; and
- (2) data relayed and logged at the Network Coordination Center (NCC) in Denver.

Descriptive information, technical data, and appraisals for CTS and ATS short-term demonstrations utilize:

- (1) user materials supplied for the development of formal demonstration requests;
- (2) technical implementation-process documentation prepared by PSSC staff;
- (3) summary reports from PSSC personnel who coordinate the various demonstrations; and
- (4) post-factum evaluations of each demonstration, which are submitted by the user.

CONCLUSIONS

Overall results are of a positive nature for long-term experiments and short-term demonstrations supported by the PSSC.

Results of long-term experiments indicate the following:

- (1) Generally, the experiments were programmatically impactive, and received with great enthusiasm; there is considerable interest for continuing the services which were presented experimentally.

- (2) Generally, high technical quality and equipment reliability are provided through the delivery systems associated with CTS and ATS-6. Equipment reliability ran lower when utilization of a remote transportable 12/14 GHz terminal was part of the delivery system; e.g., the VA transportable unit originated programs for the ALVA experiment.
- (3) Poor audio quality is provided through the VHF/ATS-1 network, but the low-cost factor and the system's effectiveness for technical coordination make it an attractive current alternative.
- (4) The assignment of organizational responsibilities amongst participants for the implementation phase, is an important activity that ought to be fully examined and mutually agreed upon at the onset. For the experiments described in this report, it was found that the higher the level of organizational preparedness, the smoother the implementation process.

Results of CTS and ATS short-term demonstrations show that:

- (1) Satellite demonstrations make a convincing statement about technical feasibility.
- (2) The demonstrations provide first-hand experience to societal groups without an extensive investment in money or facilities.
- (3) The demonstrations provide an educational experience about the technical development and implementation process involved in satellite utilization.

- (4) The demonstrations make a positive impact on the constituencies of various societal groups.
- (5) The demonstrations create a serious interest in alternatives to existing systems.

SUMMARY OF RECOMMENDATIONS

Both long-term and short-term experiments reported in this study have demonstrated the benefits of satellite usage for public service applications. The positive impact accomplished by the demonstrations and experiments, along with a considerable number of applicants for future projects, indicates the desirability of continued provisions for support of these societal efforts.

A particular necessity is to continue the follow-on dialogue and collaboration with societal users at each stage of their development. Some who have just completed a demonstration are ready and want to know options for regular operations using commercial satellites. Others want to follow short-term experiences with more serious long-term experimentation. The Public Service Satellite Consortium is prepared to assist these groups and to move forward with each as their needs dictate. The PSSC wants societal users to be aware, and plans to continue the interactive and support process between their requirements and the Consortium's actions.

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LONG-TERM SATELLITE EXPERIMENTS

PURPOSE

The following study describes long-term experiments which are supported through usage of the Denver, Colorado, satellite communications ground station complex. The report covers the period October, 1977, through March, 1978, and includes an assessment of experiment operations and technical delivery systems.

METHODOLOGY

Documentation for the report utilizes (1) information received from respective participants of each experiment, and (2) data relayed and logged at the Network Coordination Center in Denver.

DESCRIPTION OF EXPERIMENTS

ALFE (Alaska Feed Experiment). The goal of the ALFE Experiment is to deliver public broadcast programming to Alaskan audiences in a timely fashion. PBS programs are delivered to the Rocky Mountain Public Broadcast Network (RMPBN) in Denver; ATS-6 transmissions originate from RMPBN which is co-located with the PSSC Denver facility. Receive sites in Alaska are located at station KAKM in Anchorage, and station KUAC in Fairbanks.

SAMFE (Samoa Feed Experiment). SAMFE is another project involved in the delivery of public broadcast programming. The receive site in Samoa is located at station KVZK. Previous to the experiment, public broadcast programming was available to Samoan audiences through the

mailing of tapes, which were received as much as two weeks later than the original "airing" time of the programs.

MSHC (Mountain States Health Corporation Experiment). The MSHC Experiment utilized the ATS-6 to disseminate refresher training materials to emergency medical technicians in Montana. The Emergency Medical Training (EMT) refresher course developed by MSHC, concentrated on the upgrading of skills of EMT's as well as critical-care nurses and emergency-room support personnel. The ATS-6 receive site for the MSHC experiment was located at the Flathead Valley Community College in Kalispell, Montana. Transmissions took place from the Rocky Mountain Public Broadcast Network and the PSSC Denver facility.

ALVA (Alaska/Veterans Administration Experiment). Utilizing both ATS-6 and CTS, the ALVA Experiment is able to link the Alaska Area Native Health Service (AAHS) at Anchorage with the Veterans Administration's CTS Experiment. The Denver facility provides the interconnect capability between the ATS-6 and CTS.

VA (Veterans Administration Experiment). The Veterans Administration has established an experimental network which is examining biomedical applications on CTS; this VETSAT network is being utilized in a health/communications experiment intended to determine future applications for satellite communications in this area of medical information exchange. The ground system of the VETSAT network consists of a mobile earth station capable of transmitting video and audio to thirty receive sites located at VA hospitals in the western United States.

As part of the maintenance support provided by the PSSC, a CTS receive terminal at the Denver complex in Colorado, is used to monitor and troubleshoot all programming.

DISP (Department of Interior Satellite Project). The Department of Interior Satellite Project is currently utilizing the ATS-1 in a multi-disciplined educational program for the Trust Territories at Ponape, Palau, Saipan, and Majuro, where VHF terminals are located. The DISP network will include 21 VHF stations by June, 1978, and will be augmented later in 1978 when video applications will be tested via ATS-6. The Denver facility is used to relay teleconferences between the Trust Territory locations and locations in the eastern United States in Washington, D.C., and in New York.

NETWORK COORDINATION

Programming

Generally, the experiments and their respective program focus, were received with great enthusiasm.

Comments received from participants in the ALFE experiment, stations KUAC and KAKM in Alaska, and RMPBN, indicate that the project has had considerable success and impact, and has been a large step forward in provision of public broadcast programming to Alaskan audiences. The ALFE experiment will conclude in August of 1978, when the delivery will move from an experimental to regular-operations mode; at that time, the WESTAR system will be employed to deliver public broadcast programming to over 150 public television stations throughout

the United States, including Alaska.

The following comments were received from station KVZK in Samoa regarding the SAMFE experiment:

"The response from our viewing audience has been outstanding. The viewers especially appreciate the timely feeds of Washington Week in Review and Wall Street Week. While a one-day delay on the ABC Captioned News is not ideal, it certainly is a great improvement over the NBC Nightly News on a one-week tape delay out of San Francisco."

No written comments have been received about the MSHC or DISP experiments. However, there has been some indication of the positive programmatic impact made: the Flathead Valley Community College at Kalispell, Montana, (which was part of the MSHC experiment) is currently exploring possibilities for continued satellite experimentation in other programmatic areas (programmatic emphasis for the MSHC experiment was on emergency medical training); and the DISP experiment is planning to augment its network to include more VHF stations as well as the video via ATS-6.

For the ALVA experiments, verbal reports have been received which indicate a high level of satisfaction with the applicability of the programming provided to the Alaska Area Native Health Service.

Technical Coordination

For the ALFE, SAMFE, MSHC, and ALVA experiments, operating procedures and technical coordination process responsibilities were sufficiently in place prior to operations to ensure smooth implementation from the onset of those projects. The following are some of the comments received, which attest to the success and importance of the

technical coordination process.

ALFE, regarding coordination during regular operations; i.e., not involving the eclipse period:

Station KAKM: "The system is meeting or exceeding all predetermined parameters. We have had excellent cooperation from the Denver operation center. They've been able to locate and repair problems in an expeditious manner."

Station KUAC: "Things are going smoothly."

ALFE, regarding coordination during the planned ATS-6 outage period:

Station KAKM: "It is such a relief to know that there really are people who make things happen (reference is to station KUAC, RMPBN, and PSSC) -- and, without the help and devotion of all of them, our service to south-central Alaska would be diminished."

RMPBN: "NASA and PSSC cooperation was excellent, making both RMPBN and the stations' transition much simpler."

SAMFE:

Station KVZK: "On Monday, February 27, 1978, Television Station KVZK received the first two hours of PBS programming via the NASA ATS-6 Satellite. The coordination and support by the PSSC and RMPBN was outstanding. Audio communication between KVZK and Denver was possible through the use of ATS-1. The prearranged ATS-6 schedule provided 45 minutes of set-up time each day; two hours of program feeds on Monday, Tuesday, and Thursday; three hours on Wednesday; and one hour on Friday. This schedule allowed for the same-day timely feeds of Wall Street Week and Washington Week in Review on Fridays. The three-hour block on Wednesday allowed extra time for PBS Specials. Other than the fact that there were several PBS programming changes, we experienced no real problems in terms of the actual video/audio feeds on ATS-6."

The DISP experiment has experienced some implementation difficulties due to unclear assignment of organizational responsibilities amongst

the participants. The only significant problem has been lack of schedule awareness by the remote sites in the Trust Territories. However, it should be noted, that there is a real communications problem in that part of the world; which, in itself, underlies the need for satellite experimentation in this area.

TECHNICAL EFFECTIVENESS

Attachment A shows operating times and outages for the experiments described in this report. Reliability for the total delivery system of each experiment is computed as follows:

$$P_R = \frac{\text{Total (programming) time}}{\text{Total (programming) time} + \text{Total (programming) downtime}}$$

Using the above formula, reliability for the following experiments was computed for the period October 1, 1977 through March 31, 1978.

ALFE:

$$\begin{aligned} P_R &= \frac{48,281 \text{ minutes}}{48,281 \text{ minutes} + 397.5 \text{ minutes}} \\ &= 99.18\% \end{aligned}$$

SAMFE:

$$\begin{aligned} P_R &= \frac{2,904 \text{ minutes}}{2,904 \text{ minutes} + 0 \text{ minutes}} \\ &= 100\% \end{aligned}$$

MSHC:

$$\begin{aligned} P_R &= \frac{1,738 \text{ minutes}}{1,738 \text{ minutes} + 0 \text{ minutes}} \\ &= 100\% \end{aligned}$$

ALVA:

$$P_R = \frac{1,622 \text{ minutes}}{1,622 \text{ minutes} + 349 \text{ minutes}}$$
$$= 82.29\%$$

VA MONITOR:

$$P_R = \frac{2,968 \text{ minutes}}{2,968 \text{ minutes} + 425.6 \text{ minutes}}$$
$$= 87.46\% **$$

Regarding the quality of the delivered ATS-6 signal for ALFE, SAMFE, and MSHC, written and verbal reports indicate a consistently high performance. Considerable documentation was possible at Station KUAC in Fairbanks and Station KAKM in Anchorage (receive sites in the ALFE network) where SNR readings were obtained both by PSSC personnel visiting those locations and personnel at those stations. Weighted signal-to-noise ratios have consistently been measured between 46-48 dB. While SNR's were not taken for the SAMFE and MSHC sites, signal strengths and subjective video and audio comments were comparable for both experiments to those reported by operators in the ALFE experiment. (For SAMFE, signal strengths ranged between 11 and 15, and subjective comments indicated a TASO 1 signal being received. For MSHC, signal strengths ranged between 14 and 20, and subjective comments also indicated a TASO 1 signal being received.*

Regarding reliability for ALVA and VA, more than one half of the low performance of the CTS delivery system for the VA network has been caused

*TASO 1 is the standard set by the Television Allocation Study Organization to describe a picture of high quality with imperceptible noise or objectionableness.

**The PSSC maintenance function for the VA, including usage of the 12 GHz system in Denver for monitoring, does not come under NASA's ASVT contract with PSSC.

by transmitter problems at the VA mobile earth station used to originate programming. When all equipment in the network is functioning properly, signal quality has been estimated to be at the level of a TASO 1.

Reliability for the DISP experiment cannot be accurately computed. The system was operated for a total of 254 hours and 4 minutes during the period covered by this report; utilization, however, was intermittent and the system was used minimally when the only scheduling that could be arranged was during the early morning hours. Greater usage during the more convenient daytime hours that were recently arranged, indicates that this is an important factor in usage of the system. Regarding the quality of the communications that did occur, poor audio quality was generally provided through the DISP VHF/ATS-1 network, but the low-cost factor and the system's effectiveness for technical coordination make it an attractive current alternative.

SUMMARY

The long-term experiments reported in this study have all achieved a significant level of programmatic and technical success. With the exception of the mobile unit used for the VA and ALVA experiments, all equipment in the NASA experimental networks, including the satellites, have performed at a high level of reliability. Signals provided through usage of the ATS-6 and CTS network have been excellent. Audio signals associated with the VHF/ATS-1 network were rated at a lower level, but usable for purposes such as technical coordination.

Overall, programmatically and technically, the positive impact accomplished, along with a considerable number of applicants for future projects, indicates the desirability of continued provisions for support of these societal efforts.

SHORT-TERM SATELLITE DEMONSTRATIONS

BACKGROUND AND PURPOSE

One of the PSSC functions, which facilitates awareness and utilization of satellite communications technology, is the short-term demonstration. As an approved experimenter on the Applications Technology Satellite (ATS-6) and the Communications Technology Satellite (CTS), the PSSC has provided assistance to a number of organizations for short-term satellite demonstrations. The following reports include purposes, scope, and results of demonstrations that were completed during the period October 1, 1977 - March 31, 1978.

METHODOLOGY

Information utilized is a product of: (1) user materials supplied for the development of formal demonstration requests; (2) technical implementation process documentation prepared by PSSC staffs; (3) summary reports from PSSC personnel who coordinate the demonstrations; and, (4) post-factum evaluations of each demonstration, which are submitted by the user.

THE AMERICAN DIETETIC ASSOCIATION CTS Demonstration: 10/14/77

The American Dietetic Association (ADA) is comprised of over 32,000 dietitians, all of whom meet the ADA membership requirement of a baccalaureate degree from an accredited college or university. The ADA purposes are (1) to improve the nutrition of human beings, (2) to advance the science of dietetics and nutrition, and (3) to promote education in these and allied areas.

The American Dietetic Association satellite demonstration took place in October. The mode was one-way video with audio feedback between Bethesda, Maryland, and Los Angeles, California. Two congressmen on the east coast gave the presentation from the Lister Hill facility in Maryland. Due to time constraints on their positions, these gentlemen would otherwise have been unable to participate in the Los Angeles meeting. The presentation focused on "Nutrition Education: Where Do We Go From Here?" At the Los Angeles Convention Center, where a Class II portable unit was used, an estimated 1,600 health practitioners had an opportunity to experience the use of a communications satellite firsthand.

The ADA satellite demonstration was an outstanding success. It provided an introductory experience to the potential of communications satellites, and it allowed interaction with two nationally recognized presenters who were otherwise unable to attend the meeting.

THE BUREAU OF RECLAMATION
CTS Demonstration: 10/28/77

The Bureau of Reclamation, U.S. Department of Interior, is currently involved with the development of over 400 dams in scattered locations throughout the United States. Large teams and departments, involving many personnel, are responsible for the development and direction of construction activities. Consequently, central offices require constant feedback to determine what is happening at the construction sites to direct procedures, and to make necessary changes and modifications. The Bureau of Reclamation is exploring the potential cost savings of employing satellite technology in this area of activity.

In October, the Bureau of Reclamation conducted a two-hour experiment between Edna, Texas, and Denver, Colorado. The purpose was for the experience in satellite usage, particularly as a first step in the process whereby designers, administrators, and engineers will determine what cost savings can be gained through satellite usage. A GSFC Class I portable terminal was used for Edna, Texas; a GSFC Class II was used for the Federal Center at Denver, Colorado. Construction engineers at the Palmetto Bend Dam construction site in Edna pointed out and explained the status of the construction activity and problems encountered. Planners and designers in Denver learned of problems needing resolve and answered those immediately solvable.

Technically, the video was excellent; the audio was readable, but noisy. In all, Bureau of Reclamation officials were interested and receptive to the demonstration. It was a first experience for many, and will certainly require further discussion and many answers before a serious determination of cost benefits can be made. As with all interested users, the Consortium plans further dialogue with the Bureau of Reclamation and in-depth discussions about their requirements.

LISTER HILL NATIONAL CENTER FOR BIOMEDICAL COMMUNICATIONS
CTS/ATS-6 Demonstration: 11/6,7/77

The PSSC provided coordination and technical assistance support for a satellite demonstration sponsored by the Lister Hill National Center for Biomedical Communications. The event took place on November 6 and 7. The configuration involved CTS, ATS-6, a Class I terminal located at Anaheim, California, for the first day, and relocated at Los Angeles

for the second day, the Lister Hill CTS facility at Bethesda, Maryland, and an ATS-6 transmit station at Lexington, Kentucky. Full duplex audio and video capabilities were provided between the California and Maryland locations.

The demonstration was part of a medical symposium in which a large number of people from the medical community were exposed to the opportunities afforded by satellite technology, and engaged in a serious consideration of its applications for particular aspects of medicine. Lister Hill supported the Society for Neuroscience for the symposium, entitled, "Symposium on the Future of Communications in Neuroscience."

Technical problems did occur during the demonstration, none of which related to the GSFC Class I terminal which performed adequately. The problems related to CTS, and also to the relay configuration involved in the Lexington location.

The demonstration served to expose a large number of people within the medical community to the possibilities of satellite applications.

APPALACHIAN REGIONAL COMMISSION
CTS/ATS-6 Demonstration: 11/21/77

The PSSC sponsored and provided technical coordination and implementation support to the Appalachian Regional Commission for a satellite demonstration that occurred on November 21, 1977. The mode was one-way video with voice interaction. A Class I transmitted from studios at Station KPBS in San Diego, to 45 ATS-6 receive video sites. The CTS/ATS relay was achieved using NASA's Rosman facility. Voice interaction was achieved via ATS-3 between ARC's Lexington facility and a NASA/Goddard portable VHF terminal located at San Diego. A temporary teletype link

was also arranged between ARC/Lexington and the KPBS studio in San Diego, providing hard copy of questions from the Appalachian sites being relayed to the Symposium moderator by Lexington.

The purpose of the demonstration was to bring new information and research from a distant location to the Appalachian region. A National Association for Social Workers Biennial Symposium was held, and through a demonstration of satellite technology, the Symposium brought current information to teachers, social workers, counselors, and psychologists who are widely dispersed throughout the Appalachian region.

Technical problems occurred which were related both to CTS and the Class I terminal used at San Diego. Twenty minutes of the total program time planned was lost.

Recognizing the experimental nature of these demonstrations, the Appalachian Regional Commission was pleased with the effort and felt that a positive point had been made to its constituency.

DHEW/SAMOA
CTS, ATS-3, ATS-6 Demonstration: 12/28/77

On December 28, 1977, the Department of Health, Education, and Welfare, in cooperation with the National Aeronautics and Space Administration, sponsored a satellite teleconference among U.S. Government officials in Washington, D.C., and San Francisco, California, and local government officials of American Samoa. The project was designed to demonstrate the application of communications satellites in the management, planning, and delivery of Department services to remote locations.

The configuration employed the use of three communications satellites: CTS, ATS-3, and ATS-6. Programming, originating from either Ames Research Center in San Francisco, or NASA Headquarters in Washington, D.C., was to be transmitted via CTS facilities at NASA Goddard Space Flight Center in Greenbelt, Maryland, to Denver, Colorado, for retransmission to Samoa on ATS-6. The Denver Uplink Terminal (DUT), managed and operated by the Public Service Satellite Consortium, would facilitate the CTS/ATS-6 relay. Mutual access to ATS-3 would provide an audio teleconferencing link between Samoa and each of the three U.S. sites.

Due to problems with the GSFC high-power transmitter, a last-minute change in the configuration was effected. NASA Headquarters was forced to drop out of the CTS link, and a change in antenna pointing resulted in programming for Denver/Samoa originating exclusively from studios at Ames. Utilizing a teleconferencing telephone for audio transmit from Headquarters to Ames, the three-way interactive mode was maintained for the program.

Technically, minor problems did occur, but the overall system performance was excellent. The demonstration itself was received with interest and enthusiasm.

DOI SAMOA/SAIPAN
ATS-1, ATS-6 Demonstration: 1/3,8/78

The U.S. Department of the Interior, in cooperation with the National Aeronautics and Space Administration, sponsored an ATS-6 demonstration on January 3 in American Samoa and on January 8 in Saipan, each in con-

junction with inaugural celebrations of the newly appointed Governors of the respective islands. Utilization of ATS-6 was for the purpose of providing a videotaped program of President Jimmy Carter delivering a welcoming address to each of the new officials.

The Public Service Satellite Consortium provided operational and implementation support through facilities at the Network Coordination Center and the Denver Uplink Terminal. The mode was one-way video, accessing ATS-6, with audio talkback facilitated by the use of NASA's ATS-1. Videotape playback was provided by the Rocky Mountain Public Broadcasting Network co-located at the Denver facilities.

Due to program schedule changes, the ATS-6 activity on January 3 to Samoa was cancelled. However, a successful demonstration in Saipan was achieved on January 8 as scheduled. Video and audio quality were excellent; and operationally, the transition from local activities in Saipan to the satellite presentation was well coordinated and smoothly implemented. Based on immediate audio responses, the activity was well received and appreciated by both officials and audience in attendance.

ONTARIO EDUCATIONAL COMMUNICATIONS AUTHORITY
CTS Demonstration: 1/13/78

The Ontario Educational Communications Authority (OECA) conducted a teleconference on CTS in conjunction with Project Interchange (CTS Experiment 16) and the Public Service Satellite Consortium (CTS Experiment 21) on January 18, 1978, from 3:30 p.m. to 5:00 p.m. EST.

The PSSC provided limited support for this demonstration, mainly in the area of acquiring satellite time for simulation and testing one

week prior to the demonstration.

The main thrust of the teleconference was to demonstrate the applications of satellite communications for educational purposes; specifically, to enhance the effective utilization of an innovative technique for teaching reading to primary grade students. Creators of this technique, called the "Readalong" system, presented the teaching series from a studio in Toronto, Ontario, Canada. The material was received by a panel of reading experts located in the Project Interchange studio in Menlo Park, California; an interactive discussion followed, exploring the educational design and research behind the series. The demonstration, utilizing full duplex video and audio between Menlo Park and Toronto, was distributed to educational television networks at both demonstration sites, enabling classroom teachers to observe the presentation and interactive discussion.

Principals involved in the planning and implementation of this demonstration all agreed that it was highly successful, both from a programmatic and technical standpoint.

MEDICAL UNIVERSITY OF SOUTH CAROLINA

CTS Demonstration: 1/10,12,13,14,15,17,19,20,21,22/78

One of the more extensive satellite demonstrations sponsored by PSSC occurred in mid-January when a series of continuing medical education programs, coordinated by the Medical University of South Carolina, were transmitted via CTS. The live interactive medical seminar linked 150 universities and hospitals in 15 southeastern states and Ohio. Twenty-one hours of videotaped programming provided the opportunity for health

care specialists to further their education and obtain AMA Category I continuing education credits. Each broadcast was followed by an information exchange between faculty and viewers via telephone and two-way television.

The PSSC provided both technical assistance and coordination support for this activity. Programs originating from Charleston, Spartanburg, and Columbia were transmitted to CTS using the NASA Portable Earth Terminal (PET) and were received by the NASA Transportable Earth Terminal (TET), located at WVIZ in Cleveland, Ohio; the Educational Television Network in Columbia; and participating television stations of the Southern Educational Communications Association CTS network in 14 additional states. An excellent example of the marriage of satellite and terrestrial systems, further distribution into individual hospitals was achieved through the cooperation of the SECA television networks, the South Carolina Health Communications Networks, the Ohio Valley Medical Microwave Network, and the Megahertz System in the Cleveland area.

The demonstration was a tremendous success, both technically and programmatically, in demonstrating an effective utilization of available technologies for meeting educational needs. The duration of the activity created scheduling difficulties on CTS; and, as a result, less-than-desirable program times were ultimately accepted. The occasional slack in anticipated attendance is attributed partially to this fact, as well as to severe weather conditions affecting several states during the first few days of broadcast. However, audience response has been extremely positive and exhibits overwhelming enthusiasm for continuation and expansion of the concept.

UNIVERSITY OF ALABAMA IN BIRMINGHAM
CTS Demonstration: 1/28,29/78

In late January, the PSSC sponsored and provided coordination support to the University of Alabama in Birmingham (UAB) for its second CTS demonstration involving the experimental use of satellite communications for continuing medical education (CME). The purpose of the two-day activity was threefold: (1) to provide CME programming for health care specialists in geographically rural areas; (2) to increase public awareness of satellites as a viable and cost-effective means for serving the CME needs and requirements; and (3) through program sharing, help to document a practical case for future expansion of the program.

The mode was one-way video with landline audio return. Programming consisted of two seminars: (1) a Cardiology Update for physicians and other health-related professionals; and (2) a workshop for dental practitioners on Restorative Dental Impression Materials. Medical personnel within a 50-mile radius of Dothan, Alabama, participated in the workshops from Dothan where the NASA Transportable Earth Terminal was used. Programming originated from Birmingham using the NASA Portable Earth Terminal. In addition, participation in the cardiovascular seminar, which was offered for AMA Category I credit, was expanded to include 28 hospitals in South Carolina via the South Carolina Health Communications Network and 8 local Birmingham hospitals in membership of the UAB Medical Microwave Network.

Technically, and programmatically, the quality of the demonstration was excellent. Light interaction was of little concern to those involved,

as responses indicated that "too thorough coverage of the subject matter left very little area for question." In general, all participants were extremely pleased and enthusiastic toward continuing efforts in this area.

UNIVERSITY OF CALIFORNIA, SAN DIEGO
CTS Demonstration: 2/11/78

On February 11, the University of California, San Diego, in cooperation with San Diego County, the City of San Diego, and the San Diego Comprehensive Planning Organization, sponsored a conference on off-shore oil drilling. Off-shore oil drilling and leasing is a unique problem to San Diego and of primary concern are the social, economic, and environmental impacts of the proposed leasing of oil tracts on the outer continental shelf off the San Diego coast.

In conjunction with the conference, the PSSC sponsored and provided technical coordination and implementation support for a teleconferencing activity among local participants and an official of the U.S. Department of Interior otherwise unable to attend. Representing DOI was Ms. Heather Ross, Deputy Assistant Secretary, Policy Budget and Administration who, speaking from the Lister Hill Center in Bethesda, Maryland, addressed the conference on national policy and local impacts of the OCS program. Throughout the program Ms. Ross entertained questions on specific areas of concern or interest from conference participants in San Diego, where a NASA Class II transportable unit was used for video receive and audio talkback.

From a technical, as well as programmatic point of view, the demonstration was an outstanding success. The interactive application

lent particular importance to the success of the activity by affording the opportunity for various planning and administrative entities in San Diego to interact directly with a decision maker at the national level.

JOINT COUNCIL ON EDUCATIONAL TELECOMMUNICATIONS
CTS Demonstration: 2/14/78

The Joint Council on Educational Telecommunications (JCET) is a consortium of non-profit organizations interested in preserving and promoting education's options in the use of communications technologies.

During the 1978 Annual Meeting of the American Association for the Advancement of Science (AAAS) held in February, the PSSC sponsored and provided coordination support to JCET for a satellite teleconferencing activity with full-duplex operations.

The purpose of the teleconference was to demonstrate and discuss the potential of satellite communications for meeting educational needs. The program consisted of presentations by five well-known leaders active in the field of societal satellite applications. Periods for detailed discussion followed each presentation.

The teleconference involved participants at three separate locations: the AAAS Annual Meeting in Washington, D.C., where the NASA Portable Earth Terminal was located; NASA Ames Research Center in Moffat Field, California; and the University of Washington in Seattle, using a fixed, full-duplex CTS facility funded by NIH.

All aspects of the event went perfectly. The viability and potential benefits of satellite utilization were clearly demonstrated in a meaningful and successful application of the technology.

FORUM FOR THE ADVANCEMENT OF STUDENTS IN SCIENCE AND TECHNOLOGY
CTS Demonstration: 2/14/78

During the afternoon session of the American Association for the Advancement of Science (AAAS) Annual Meeting in February, the PSSC also sponsored and provided technical assistance to the Forum for the Advancement of Students in Science and Technology (FASST) for another CTS teleconferencing demonstration. The purpose of this activity was to demonstrate and promote the applicability of satellite communications as one of the various "Tools of Science," the theme of this year's AAAS conference.

The demonstration involved full-duplex video and audio between fixed CTS facilities at NASA Ames Research Center and the NASA Portable Earth Terminal at the Washington, D.C., conference site. The topic of the FASST program entitled, "The Search for Extraterrestrial Intelligence: Priority or Pandora's Box," featured prominent guest speakers considered authorities on the subject. Each of these presentations was broadcast via CTS to teachers and students in attendance at Ames. The program centered on discussions of current plans to establish a dedicated search for alien life in the universe, and the possible consequences as a result of these efforts. The use of CTS enabled direct audience participation during these discussions.

Fascination with the topic has grown considerably over the past years, as the size of the viewing audience well demonstrated. At the local conference there was a "standing-room-only" situation within the viewing area while at Ames Research Center, over 200 students and

teachers gathered with interest. The demonstration itself was a technical and programmatic success which not only provided an introductory experience to the potential of communications satellites, but served to open the AAAS Annual Meeting to a large, highly interested sector of the public unable to otherwise attend.

AID/UWI/SERI

CTS Demonstration: 2/27/78

On February 27, 1978, the Agency for International Development (AID), in cooperation with the University of the West Indies (UWI), approved ATS-6 experiment, sponsored a teleconferencing demonstration via satellite. The purpose of the activity was for exchange of information between staff members of the Solar Energy Research Institute (SERI) in Denver, Colorado, and solar energy educators on the UWI campuses in Jamaica, Barbados, and St. Lucia.

The PSSC provided technical coordination, facility operations, and implementation support for the teleconference. Special provisions were made at the Network Coordination Center in Denver, Colorado, for live program origination; i.e., rental of cameras. The live programming was transmitted to ATS-6 via the Denver Uplink Terminal (DUT) in Morrison, using C-band and was received at three locations in the West Indies using the UHF transponder. Questions from the West Indies were relayed via ATS-3 to participants in the Denver studio for immediate response.

Technically, there were few problems particularly relative to ATS-6 operations. As this was the first PSSC experience involving studio operations, there were occasional problems with equipment, as well as in-house production coordination, which were of relatively minor consequence.

Of greater impact were the technical difficulties experienced during VHF operations. Although ATS-3 transmissions from Jamaica were generally acceptable, there were frequent problems in transmissions from Barbados and St. Lucia. Signal breakups and a low-level signal strength made readability difficult at times -- and on occasion, impossible; particularly on transmissions from St. Lucia. Due to the low look angles of the West Indies in using both ATS-6 and 3, it is common for this area to lose as much as 30-90 seconds/hour, as estimated by NASA; a condition familiar to the island participants. Overall, interaction was programmatically acceptable and effective, despite intermittent communications problems.

INDIANA HIGHER EDUCATION TELECOMMUNICATIONS SYSTEM
CTS Demonstration: 2/25,28/78

The member institutions of the Indiana Higher Education Telecommunications System (IHETS) conducted a demonstration on CTS on February 25 and 28, 1978, aimed at assessing the potential of satellite communications in the field of professional continuing education. Programming consisted of instructional materials for dental school faculties and for classroom teachers involved in the integration of handicapped children into the mainstream of our elementary and secondary education programs.

The demonstration utilized program material originating from the NASA/Lewis Portable Earth Terminal (PET), located at an IHETS studio in Indianapolis, Indiana, and from Ames Research Center in the San Francisco Bay area of California. Terrestrial interconnections at the IHETS studio made viewing and audio talkback possible from 24 sites within the state-wide IHETS network. Viewing centers in California were established at

the Archdiocese of San Francisco in Menlo Park and at the Veteran's Administration Hospital at Long Beach, where permanent CTS facilities were utilized. An existing ITFS interconnection through the Archdiocese of San Francisco's Educational Television Center was also employed to deliver the demonstration to the University of California's San Francisco campus where faculty and students involved in developing program materials for this activity were assembled for viewing.

Principals involved in the programmatic and technical implementation of the demonstration considered the event entirely successful. The presentation of continuing education materials via satellite was evaluated by experts in the viewing audience as highly effective and indicative of future possibilities for utilizing satellites in this field.

GREATER CLEVELAND HOSPITAL ASSOCIATION
CTS Demonstration: 3/16/78

On March 16, 1978, the 62nd Annual Meeting of the Greater Cleveland Hospital Association was held in Cleveland, Ohio. Highlighting the conference was a teleconferencing activity on CTS designed to demonstrate the effectiveness of interconnecting geographically dispersed populations via satellite for discussion of current topics related to health care.

The PSSC sponsored and provided coordination support for this activity which involved two-way video and audio between the PET in Cleveland, and the Lister Hill facilities in Bethesda, Maryland; and one-way video and audio to television stations in the SECA network and to Indianapolis, Indiana, where the TET was located. At several of these locations, interface with terrestrial systems enabled further distribution into area

hospitals. Landlines provided an audio return for each of the receive-only locations.

Participating in the video teleconferencing were officials of major health care associations and a member of Congress active in the formulation of national health-care policy. Landline participation additionally involved hospital administrators and trustees in the discussions, although there were problems reported with the quality of the telephone link provided for this purpose. Despite these difficulties, however, the reactions of participants have been extremely positive to the concept demonstrated and enthusiastic toward future involvement in satellite activities.

NATIONAL OCEANIC & ATMOSPHERIC ADMINISTRATION
CTS Demonstration: 3/28/78

In late March, the PSSC sponsored and provided coordination and implementation support to the National Oceanic and Atmospheric Administration for a teleconferencing demonstration on CTS. The purpose of the teleconference was for information exchange between two geographically dispersed offices of NOAA, using satellite teleconferencing in lieu of costly travel for conducting routine organizational meetings.

The program was formatted for two business sessions: the Environmental Data Service (EDS) of NOAA held a project review, and the Environmental Research Laboratories (ERL) held an administrative council meeting. Participants were located at the Lister Hill facilities in Bethesda, Maryland, and at the NOAA offices in Boulder, Colorado. The NASA Class I transportable terminal was used at the Boulder site. The

mode was two-way video and audio.

Technical difficulties were experienced in the audio portion of the programming as a result of equipment malfunctions in the transportable unit. The audio was readable, but contained a hum throughout. The existence of the noise was no-doubt annoying to participants in Bethesda, but overall, had no disrupting affect on the proceedings of the meetings. The demonstration was deemed a success, with much interest expressed in on-going programs for meeting additional organizational needs of NOAA.

NORTH ALABAMA EDUCATIONAL OPPORTUNITY CENTER
CTS Demonstration: 3/30/78

In cooperation with Lewis Research Center and NASA Headquarters, the PSSC provided technical support for a CTS 2-hour demonstration by the North Alabama Educational Opportunity Center. The demonstration was held on March 30, 1978, during the "Third Annual Career Fair and NASA Aerospace Symposium."

The configuration consisted of video transmissions from Lewis Research Center in Cleveland, Ohio, to Huntsville, Alabama, with audio interaction between the two locations. The GSFC Class II was located at the Von Braun Convention Center at Huntsville, where the Symposium was held.

The demonstration was designed to give high school and college students an opportunity to utilize satellite technology to provide useful information about NASA engineers and scientists and the work they are doing at NASA's Lewis Research Center. Students had the opportunity to interface directly with scientists at NASA Lewis and to ask technical

questions about their disciplines.

More than 3,000 people witnessed the demonstration, which was programmatically and technically impactful. Participating students felt it particularly beneficial for the experience provided.

THE TECHNICAL COORDINATION PROCESS

The PSSC offers operational implementation support, and technical planning/coordination support for satellite demonstrations. Figure I outlines the process and activities involved in standard coordination support provided for satellite demonstrations.

Figure I

Standard Coordination Support Provided by
the PSSC for Satellite Demonstrations.

Process/Activities

- I. Initial Contact of PSSC for a Demonstration
- II. Preliminary Investigation into Demonstration Possibilities.
 - A. Schedule Possibilities.
 - B. Satellite Terminal Possibilities.
- III. The Development of the User Demonstration Packet, which provides information that the user will need in planning a demonstration.
 - A. Letter of Agreement, outlining the role and responsibilities of the User and that of the PSSC.
 - B. Satellite Terminal Possibilities (locations and capabilities).
 - C. Satellite Terminal Costs.
 - D. Site Survey Information and Tasks that will be necessary.
 - E. Simulation/Checkout Information.
 - F. Broadcast requirements, including phone interconnections.
 - G. Post Factum Evaluation Requirements.
- IV. The Development of a Demonstration Implementation Packet.
 - A. Formal Demonstration Request
 - B. Operations Plan for the Demonstration.
 1. Operations (Tx/Rx frequencies at satellite locations).
 2. Simulation/Test Date(s) and Time(s).
 3. Demonstration Date(s) and Time(s).
 4. Pointing information (azimuth, elevation, magnetic variation, etc.)
 5. Network Coordinator (as required by NASA, the designated real-time coordinator).
 6. Conference Call (for the NASA/Lewis Network Coordinator).
 7. Troubleshooting procedures, including the designated "scrub" person.
 8. Contact/Coordinators (names, addresses, and phone numbers).
 9. Frequency Coordination (overview diagram of satellite configuration, uplinks, downlinks, subcarriers, terminal location).
 10. Site Survey for Mobile Units (type, location, address, coordinates).
 11. Additional Site Survey Information for PSSC Technicians (security, parking arrangements, interference, power availability, cable availability and access procedures, peripheral equipment required, etc.)
- V. Post Demonstration Summary

This summary does not replace the User's Post Factum Evaluation, but rather, supplements information. It allows the PSSC person most familiar with the demo, from planning to implementation stage, to assess the demo process as well as overall effectiveness.

SUMMARY AND CONCLUSIONS

Results of completed demonstrations have been extremely positive. Certain outcomes and advantages of brief satellite presentations have been pervasive throughout all the demonstrations. Specifically, short-term satellite demonstrations are a successful technique for:

1. making a convincing statement about technical feasibility;
2. providing first-hand experience to societal groups without an extensive investment in money or facilities;
3. providing an educational experience about the technical development and implementation process involved in satellite utilization;
4. making a positive impact on the constituencies of various societal groups; and
5. creating a serious interest in alternatives to existing systems.

In short, short-term satellite demonstrations have offered, and have provided, an educational and informational service to numerous societal groups and their constituencies.

The request for demonstrations is continuing. Further, the demand for satellite time and for mobile earth stations in support of demonstrations, exceeds the availability of these elements. Figure II shows organizations who are currently receiving support for short-term demonstrations being planned.

Figure II
ORGANIZATIONS CURRENTLY RECEIVING SUPPORT FOR SHORT-TERM DEMONSTRATIONS

* Verbal Confirmation
** Written Confirmation

LP Loop Through
RLY - Relay
TX Transmit

Draft Date: April 6, 1978

DATE (GMT)	TIME (GMT)	ORGANIZATION/CONTACT	SATELLITE	LERC EQUIPMENT	GSFC EQUIPMENT	OTHER	LOCATION OF EQUIPMENT	TEST DATE/TIME	PURPOSE
4/26	1300-1615	Radio & TV Commission So. Baptist Convention	CTS		Class I Class II		Ft. Worth, Texas Nashville, Tennessee	4/24 1400-1600	Annual Conference
5/8	1515-1715	Med. Univ. of So. Carolina	CTS		Class I		Charleston, South Carolina	5/7 1500-1800 (GMT)	
5/10	2130-0015								
6/12	1930-2200	AHA Hospital Trainers Annual Meeting	CTS	PET or	Class I		New Orleans, Louisi- siana		Teleconference
7/8	1300-1500	AASA	CTS	TET			Minneapolis, Minn.		Teleconference for Semi-Annual Conven- tion
7/8		UNICON	CTS	PET			Silver Springs, MO.		UNICON IV Conference
9/12		Amer. Hosp. Assoc.	CTS	PET or	Class I	AMES	San Francisco, CA. Anaheim, CA.		Teleconference for Annual Convention
9/21		National Council of the Churches of Christ							
9/28	1300-1530	American Library Assoc.	PET or	Class I			Ann Arbor, Michigan		
NOTE: Assistance with the following demonstrations has been requested. Dates and times have not yet been arranged. Univ. of California, Davis Medical Care Development, Inc. Science Center Satellite Network Univ. of Wisconsin, Stevens Point Radif Foundation									

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APPENDIX A
Experiment's Operating Times and Outages

OPERATING TIMES AND OUTAGES

(GMT) DATE	MODE	OPERATING TIME		OUTAGES
		NCC/DUT	ON-AIR	
10/1/77	ALFE	3 HR 44 MIN	2 HR 59 MIN	
10/2/77	ALFE	3 HR 42 MIN	2 HR 57 MIN	
10/2/77	ALFE	2 HR 14 MIN	1 HR 29 MIN	
10/3/77	ALFE	3 HR 51 MIN	3 HR 4 MIN	
10/4/77	ALFE	3 HR 46 MIN	3 HR 1 MIN	
10/4/77	ALFE	2 HR 18 MIN	1 HR 29 MIN	
10/5/77	ALFE	3 HR 45 MIN	2 HR 59 MIN	
10/5/77	ALFE	2 HR 17 MIN	1 HR 31 MIN	
10/6/77	ALFE	3 HR 48 MIN	3 HR 2 MIN	
10/6/77	ALFE	2 HR 19 MIN	1 HR 32 MIN	
10/7/77	ALFE	3 HR 45 MIN	2 HR 59 MIN	
10/7/77	ALFE	2 HR 16 MIN	1 HR 30 MIN	
10/8/77	ALFE	3 HR 48 MIN	3 HR 2 MIN	
10/9/77	ALFE	3 HR 45 MIN	2 HR 59 MIN	
10/10/77	ALFE	3 HR 44 MIN	2 HR 59 MIN	
10/10/77	ALFE	2 HR 17 MIN	1 HR 30 MIN	
10/11/77	ALFE	3 HR 45 MIN	2 HR 59 MIN	
10/11/77	ALFE	2 HR 20 MIN	1 HR 34 MIN	
10/12/77	ALFE	3 HR 45 MIN	2 HR 59 MIN	
10/13/77	ALFE	3 HR 47 MIN	3 HR	
10/14/77	ALFE	3 HR 47 MIN	3 HR	
10/15/77	ALFE	4 HR 16 MIN	3 HR 29 MIN	
10/16/77	ALFE	3 HR 46 MIN	2 HR 59 MIN	5 SEC (NCC switching error)
10/17/77	ALFE	5 HR 45 MIN	4 HR 59 MIN	
10/18/77	ALFE	5 HR 29 MIN	4 HR 40 MIN	2 MIN 30 SEC (RMPB fed in- correct program)
10/19/77	ALFE	5 HR 46 MIN	5 HR	
10/20/77	ALFE	5 HR 16 MIN	4 HR 29 MIN	
10/21/77	ALFE	5 HR 16 MIN	4 HR 29 MIN	
10/22/77	ALFE	5 HR 16 MIN	4 HR 29 MIN	
10/23/77	ALFE	5 HR 16 MIN	4 HR 29 MIN	
10/24/77	ALFE	5 HR 15 MIN	4 HR 29 MIN	
10/25/77	ALFE	5 HR 16 MIN	4 HR 29 MIN	

OPERATING TIMES AND OUTAGES

(GMT) DATE	MODE	OPERATING TIME		OUTAGES
		NCC/DUT	ON-AIR	
10/26/77	ALFE	5 HR 15 MIN	4 HR 29 MIN	4 MIN (HET Transmit down at ATSOCC)
10/27/77	ALFE	5 HR 15 MIN	4 HR 29 MIN	
10/27/77	ALFE	3 HR 15 MIN	2 HR 30 MIN	
10/28/77	ALFE	2 HR 54 MIN	2 HR 9 MIN	
10/29/77	ALFE	5 HR 15 MIN	4 HR 29 MIN	
10/30/77	ALFE	5 HR 46 MIN	5 HR	20 S/C (OD Tape Machine Failure)
10/31/77	ALFE	5 HR 15 MIN	4 HR 29 MIN	
11/1/77	ALFE	5 HR 40 MIN	4 HR 30 MIN	
11/2/77	ALFE	5 HR 18 MIN	4 HR 29 MIN	
11/3/77	ALFF	5 HR 18 MIN	4 HR 59 MIN	
11/4/77	ALFE	5 HR 15 MIN	4 HR 29 MIN	
11/5/77	ALFE	5 HR 15 MIN	4 HR 29 MIN	
11/6/77	ALFE	5 HR 21 MIN	4 HR 35 MIN	
11/7/77	ALFE	5 HR 14 MIN	4 HR 29 MIN	
11/8/77	ALFE	5 HR 14 MIN	4 HR 28 MIN	
11/9/77	ALFE	5 HR 28 MIN	4 HR 29 MIN	
11/10/77	ALFE	5 HR 17 MIN	4 HR 29 MIN	
11/11/77	ALFE	5 HR 16 MIN	4 HR 29 MIN	
11/11/77	VA TEST *	2 HR 30 MIN		
11/12/77	ALFE			No feed. ATS-6 lost earth -- 4 HR 30 MIN
11/13/77	ALFE	6 HR 18 MIN	5 HR 28 MIN	
11/14/77	ALFE	5 HR 18 MIN	4 HR 29 MIN	
11/15/77	ALFE	5 HR 16 MIN	4 HR 29 MIN	
11/16/77	ALFE	5 HR 30 MIN	4 HR 42 MIN	
11/17/77	ALFE	5 HR 18 MIN	4 HR 29 MIN	
11/17/77	ALVA/VA* TEST	2 HR 8 MIN		
11/17/77	VA TEST *	2 HR 15 MIN		
11/18/77	ALFE	5 HR 18 MIN	4 HR 29 MIN	
11/18/77	ALVA/VA*	1 HR 1 MIN		CTS unavailable. ALVA/VA transmission cancelled: 2 HR
11/19/77	ALFE	5 HR 17 MIN	4 HR 29 MIN	
11/20/77	ALFE	5 HR 23 MIN	4 HR 36 MIN	
11/21/77	ALFE	5 HR 18 MIN	4 HR 30 MIN	
11/22/77	ALFE	5 HR 16 MIN	4 HR 30 MIN	

OPERATING TIMES AND OUTAGES

(GMT) DATE	MODE	OPERATING TIME		OUTAGES
		NCC/DUT	ON-AIR	
11/23/77	ALFE	5 HR 16 MIN	4 HR 29 MIN	
11/24/77	ALFE	5 HR 15 MIN	4 HR 29 MIN	
11/25/77	ALFE	1 HR 15 MIN	29 MIN	
11/26/77	ALFE	5 HR 15 MIN	4 HR 29 MIN	
11/27/77	ALFE	7 HR 3 MIN	4 HR 29 MIN	
11/28/77	ALFE	5 HR 15 MIN	4 HR 28 MIN	
11/29/77	ALFE	5 HR 15 MIN	4 HR 28 MIN	
11/30/77	ALFE	5 HR 15 MIN	4 HR 29 MIN	1 SEC (unexplained video drop-out)
12/1/77	ALFE	5 HR 15 MIN	4 HR 29 MIN	
12/1/77	VA TEST*	2 HR 15 MIN		
12/2/77	ALFE	5 HR 16 MIN	4 HR 30 MIN	
12/2/77	ALVA/VA*	3 HR 1 MIN	2 HR	
12/3/77	ALFE	5 HR 16 MIN	4 HR 28 MIN	
12/4/77	ALFE	5 HR 3 MIN	4 HR 15 MIN	
12/5/77	ALFE	5 HR 15 MIN	2 HR 59 MIN	1 HR 30 MIN (lost one phase of AC Public Serv. Co. Problem)
12/6/77	ALFE	6 HR 46 MIN	5 HR 58 MIN	
12/7/77	ALFE	5 HR 27 MIN	4 HR 40 MIN	
12/8/77	ALFE	5 HR 16 MIN	4 HR 29 MIN	
12/9/77	ALFE	5 HR 16 MIN	4 HR 30 MIN	
12/9/77	ALVA/VA*	4 HR 22 MIN	3 HR 38 MIN	
12/9/77	DISP	5 HR	5 HR	
12/10/77	ALFE	5 HR 17 MIN	4 HR 29 MIN	
12/10/77	DISP	7 HR	7 HR	
12/11/77	ALFE	5 HR 19 MIN	4 HR 32 MIN	
12/11/77	DISP	7 HR	7 HR	
12/12/77	ALFE	5 HR 18 MIN	4 HR 30 MIN	
12/12/77	ALVA/VA*	2 HR 47 MIN	2 HR	
12/12/77	DISP	4 HR 15 MIN	4 HR 15 MIN	
12/13/77	ALFE	5 HR 17 MIN	4 HR 30 MIN	
12/13/77	DISP	5 HR 10 MIN	5 HR 10 MIN	
12/14/77	ALFE	5 HR 15 MIN	4 HR 30 MIN	2 SEC (Loose wire in switcher.)
12/14/77	DISP	4 HR	4 HR	
12/15/77	ALFE	5 HR 19 MIN	4 HR 29 MIN	

OPERATING TIMES AND OUTAGES

(GMT) DATE	MODE	OPERATING TIMES		OUTAGES
		NCC/DUT	ON-AIR	
12/15/77	DISP	5 HR 10 MIN	5 HR 10 MIN	
12/16/77	ALVA/VA*	2 HR 28 MIN	1 HR 36 MIN	
12/16/77	ALFE	5 HR 17 MIN	4 HR 29 MIN	4 MIN (ATS-6 footprint shifted)
12/16/77	DISP	3 HR	3 HR	
12/17/77	ALFE	5 HR 17 MIN	4 HR 29 MIN	
12/17/77	DISP	2 HR 15 MIN	2 HR 15 MIN	
12/18/77	ALFE	5 HR 15 MIN	4 HR 28 MIN	
12/19/77	ALFE	5 HR 15 MIN	4 HR 25 MIN	
12/19/77	MSHC TEST	1 HR 17 MIN		
12/19/77	DISP	4 HR		DISP cancelled. NCC VHF TMTR down.
12/20/77	ALFE	5 HR 14 MIN	4 HR 25 MIN	
12/20/77	DISP	4 HR	4 HR	
12/21/77	ALFE	5 HR 16 MIN	4 HR 29 MIN	
12/21/77	DISP	4 HR	4 HR	
12/22/77	ALFE	5 HR 15 MIN	4 HR 29 MIN	
12/22/77	DISP	5 HR 5 MIN	5 HR 5 MIN	
12/22/77	MSHC TEST	3 HR		
12/23/77	ALFE	5 HR 16 MIN	4 HR 29 MIN	
12/23/77	DISP	7 MIN	7 MIN	Remainder of time cancelled- no further traffic needed
12/23/77	VA TEST*	3 HR		
12/24/77	ALFE	5 HR 17 MIN	4 HR 29 MIN	
12/25/77	ALFE	4 HR 18 MIN	3 HR 30 MIN	
12/26/77	ALFE	4 HR 46 MIN	3 HR 59 MIN	
12/26/77	DISP	4 HR 20 MIN	4 HR 20 MIN	
12/27/77	ALFE	5 HR 17 MIN	4 HR 29 MIN	
12/27/77	DISP	4 HR 55 MIN	4 HR 55 MIN	
12/28/77	ALFE	5 HR 16 MIN	4 HR 29 MIN	
12/28/77	DISP	4 HR 59 MIN	4 HR 59 MIN	
12/29/77	ALFE	6 HR 21 MIN	5 HR 29 MIN	

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OPERATING TIMES AND OUTAGES

(GMT) DATE	MODE	OPERATING TIME		OUTAGES
		NCC/DUT	ON-AIR	
12/29/77	DISP	4 HR 35 MIN	4 HR 35 MIN	
12/30/77	ALFE	5 HR 15 MIN	4 HR 29 MIN	
12/31/77	ALFE	5 HR 16 MIN	4 HR 29 MIN	
12/31/77	SAMOA	1 HR 50 MIN	1 HR 50 MIN	
1/1/78	ALFE	4 HR 45 MIN	3 HR 59 MIN	
1/2/78	ALFE	5 HR 15 MIN	4 HR 30 MIN	
1/3/78	ALFE	5 HR 18 MIN	4 HR 29 MIN	
1/4/78	ALFE	5 HR 17 MIN	4 HR 29 MIN	
1/5/78	ALFE	5 HR 15 MIN	4 HR 29 MIN	
1/5/78	DISP/SAIPAN TEST	2 HR 21 MIN		
1/5/78	ALVA/VA*	2 HR 48 MIN	2 HR	
1/6/78	ALFE	5 HR 15 MIN	4 HR 30 MIN	
1/6/78	DISP/SAIPAN TEST	3 HR 35 MIN		
1/7/78	ALFE	5 HR 15 MIN	4 HR 30 MIN	
1/7/78	DISP/SAIPAN TEST	3 HR 20 MIN		
1/8/78	ALFE	4 HR 44 MIN	3 HR 59 MIN	
1/8/78	DISP/SAIPAN TEST	2 HR 31 MIN		
1/8/78	DISP/SAIPAN TEST	3 HR 31 MIN	2 MIN	
1/9/78	ALFE	5 HR 16 MIN	4 HR 30 MIN	
1/9/78	DISP	4 HR 10 MIN	4 HR 10 MIN	
1/10/78	ALFE	5 HR 17 MIN	4 HR 29 MIN	
1/10/78	DISP	4 HR 10 MIN	4 HR 10 MIN	
1/11/78	ALFE	5 HR 17 MIN	4 HR 29 MIN	
1/11/78	DISP	4 HR 10 MIN	4 HR 10 MIN	
1/12/78	ALFE	5 HR 17 MIN	4 HR 29 MIN	
1/12/78	DISP	4 HR 10 MIN	4 HR 10 MIN	
1/12/78	ALVA/VA*	3 HR 4 MIN	1 HR 56 MIN	2 MIN (VA mobile transmitter down.)
1/13/78	ALFE	5 HR 15 MIN	4 HR 29 MIN	
1/13/78	VA MON *	1 HR 55 MIN	1 HR 39 MIN	
1/13/78	SAMOA TEST	2 HR 32 MIN		
1/14/78	ALFE	5 HR 15 MIN	4 HR 29 MIN	
1/14/78	SAMOA TEST	2 HR 2 MIN		

OPERATING TIMES AND OUTAGES

(GMT) DATE	MODE	OPERATING TIME		OUTAGES
		NCC/DUT	ON-AIR	
1/15/78	ALFE	5 HR 15 MIN	4 HR 30 MIN	30 SEC (ATS-6 switcher dropped)
1/15/78	SAMOA TEST	2 HR 3 MIN		
1/16/78	ALFE	5 HR 22 MIN	4 HR 27 MIN	
1/16/78	DISP	4 HR 10 MIN	4 HR 10 MIN	
1/16/78	SAMOA TEST	2 HR 5 MIN		
1/17/78	ALFE	5 HR 17 MIN	4 HR 29 MIN	
1/17/78	DISP	4 HR 10 MIN	4 HR 10 MIN	
1/17/78	MSHC TEST	2 HR 19 MIN		
1/18/78	ALFE	5 HR 16 MIN	4 HR 28 MIN	
1/18/78	DISP	4 HR 10 MIN	4 HR 10 MIN	
1/19/78	ALFE	5 HR 15 MIN	4 HR 10 MIN	
1/19/78	DISP	4 HR 10 MIN	4 HR 10 MIN	
1/19/78	ALVA/VA*	1 HR 30 MIN		VA mobile transmitter down - program cancelled: 2 HR.
1/20/78	ALFE	5 HR 22 MIN	4 HR 29 MIN	
1/20/78	VA MON*	2 HR 15 MIN	2 HR	46 MIN (DUT CTS receive station down.)
1/21/78	ALFE	5 HR 16 MIN	4 HR 29 MIN	
1/22/78	ALFE	5 HR 10 MIN	4 HR 27 MIN	
1/23/78	ALFE	5 HR 15 MIN	4 HR 28 MIN	
1/23/78	DISP	4 HR 10 MIN	4 HR 10 MIN	
1/24/78	ALFE	5 HR 16 MIN	4 HR 29 MIN	
1/24/78	DISP	4 HR 10 MIN	4 HR 10 MIN	
1/25/78	ALFE	5 HR 16 MIN	4 HR 29 MIN	
1/25/78	DISP	4 HR 10 MIN	4 HR 10 MIN	
1/25/78	MSHC	2 HR 15 MIN	1 HR 28 MIN	
1/25/78	VA TEST*	17 MIN		
1/26/78	ALFE	5 HR 20 MIN	4 HR 13 MIN	16 MIN (personnel scheduling error)
1/26/78	ALVA/VA*	2 HR 44 MIN	1 HR 56 MIN	2 MIN (VA Txmtr down.)
1/26/78	DISP	4 HR 10 MIN	4 HR 10 MIN	
1/27/78	ALFE	5 HR 17 MIN	4 HR 30 MIN	
1/27/78	MSHC	1 HR 58 MIN	1 HR 29 MIN	
1/28/78	ALFE	5 HR 16 MIN	4 HR 29 MIN	
1/29/78	ALFE	4 HR 18 MIN	3 HR 29 MIN	
1/30/78	ALFE	4 HR 46 MIN	3 HR 59 MIN	

OPERATING TIMES AND OUTAGES

(GMT) DATE	MODE	OPERATING TIMES		OUTAGES
		NCC/DUT	ON-AIR	
1/30/78	DISP	4 HR 10 MIN	4 HR 10 MIN	
1/31/78	ALFE	5 HR 16 MIN	4 HR 29 MIN	
1/31/78	DISP	4 HR 10 MIN	4 HR 10 MIN	
2/1/78	ALFE	5 HR 16 MIN	4 HR 29 MIN	
2/1/78	MSHC	2 HR 16 MIN	1 HR 30 MIN	
2/1/78	DISP	4 HR 10 MIN	4 HR 10 MIN	
2/1/78	VA TEST*	39 MIN		
2/2/78	ALFE	5 HR 16 MIN	4 HR 29 MIN	
2/2/78	DISP	4 HR 10 MIN		DISP cancelled. 300 W TMTR would not cycle.
2/2/78	ALVA	2 HR 10 MIN	1 HR 14 MIN	
2/3/78	ALFE	5 HR 17 MIN	4 HR 29 MIN	
2/2/78	VA MON*	2 HR 10 MIN	1 HR 40 MIN	
2/3/78	MSHC	2 HR 16 MIN	1 HR 30 MIN	
2/4/78	ALFE	5 HR 15 MIN	4 HR 29 MIN	
2/5/78	ALFE	4 HR 39 MIN	3 HR 58 MIN	
2/6/78	ALFE	4 HR 48 MIN	3 HR 50 MIN	
2/6/78	DISP	4 HR 10 MIN	4 HR 10 MIN	
2/6/78	DISP	1 HR	1 HR	
2/7/78	ALFE	5 HR 16 MIN	4 HR 29 MIN	
2/7/78	DISP	4 HR 10 MIN	4 HR 10 MIN	
2/7/78	DISP	1 HR	1 HR	
2/8/78	ALFE	5 HR 16 MIN	4 HR 29 MIN	
2/8/78	MSHC	2 HR	1 HR 30 MIN	
2/8/78	DISP	4 HR 10 MIN	4 HR 10 MIN	
2/8/78	SAMOA TEST	2 HR 47 MIN		
2/8/78	DISP	1 HR	1 HR	
2/9/78	ALFE	5 HR 17 MIN	4 HR 29 MIN	
2/9/78	DISP	4 HR 10 MIN	4 HR 10 MIN	
2/9/78	DISP	1 HR	1 HR	
2/9/78	ALVA	2 HR 3 MIN	1 HR 17 MIN	
2/9/78	VA MON*	2 HR 30 MIN	2 HR	
2/10/78	ALFE	5 HR 17 MIN	4 HR 29 MIN	
2/10/78	MSHC	1 HR 55 MIN	1 HR 29 MIN	

OPERATING TIMES AND OUTAGES

(GMT) DATE	MODE	OPERATING TIMES		OUTAGES
		MCC/DUT	ON-AIR	
2/10/78	VA MON*	2 HR 28 MIN	2 HR 13 MIN	
2/10/78	DISP	1 HR	1 HR	
2/11/78	ALFE	5 HR 6 MIN	4 HR 29 MIN	
2/12/78	ALFE	5 HR 12 MIN	4 HR 29 MIN	
2/13/78	ALFE	5 HR 19 MIN	4 HR 29 MIN	
2/13/78	DISP	4 HR	4 HR	
2/13/78	DISP	1 HR	1 HR	
2/14/78	ALFE	4 HR 4 MIN	3 HR 34 MIN	
2/14/78	DISP	4 HR	4 HR	
2/14/78	DISP	1 HR 30 MIN	1 HR 30 MIN	
2/15/78	ALFE	2 HR 47 MIN	1 HR 59 MIN	
2/15/78	VA TEST *	45 MIN		
2/15/78	MSHC	2 HR 15 MIN	1 HR 29 MIN	
2/15/78	DISP	4 HR	4 HR	
2/15/78	DISP	1 HR	1 HR	
2/16/78	ALFE	4 HR 13 MIN	3 HR 28 MIN	
2/16/78	DISP	3 HR	3 HR	
2/16/78	DISP	1 HR	1 HR	
2/16/78	ALFE	1 HR 48 MIN	59 MIN	
2/16/78	ALVA	1 HR 55 MIN	1 HR 10 MIN	
2/16/78	VA MON*	2 HR 44 MIN	1 HR 59 MIN	
2/17/78	MSHC	1 HR 56 MIN	1 HR 30 MIN	
2/17/78	ALFE	2 HR 48 MIN	2 HR	
2/17/78	DISP	1 HR	1 HR	
2/18/78	ALFE	3 HR 12 MIN	2 HR 29 MIN	
2/18/78	ALFE	8 HR 12 MIN	7 HR 28 MIN	
2/19/78	ALFE	4 HR 16 MIN	3 HR 29 MIN	
2/20/78	ALFE	4 HR 16 MIN	3 HR 30 MIN	6 MIN (DUT personnel locked out)
2/20/78	DISP	4 HR	4 HR	
2/20/78	DISP	1 HR	1 HR	
2/21/78	ALFE	4 HR 12 MIN	3 HR 29 MIN	
2/21/78	DISP	4 HR	4 HR	
2/21/78	DISP	1 HR	1 HR	

** 2/17/78 VA MON*

2 HR Program cancelled. (VA Mobile Transmitter down.)

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OPERATING TIMES AND OUTAGES

(GMT) DATE	MODE	OPERATING TIMES		OUTAGES
		NCC/DUT	ON-AIR	
2/22/78	MSHC	2 HR 15 MIN	1 HR 30 MIN	
2/22/78	VA MON*	2 HR	55 MIN	
2/22/78	ALFE	3 HR 34 MIN	2 HR 30 MIN	
2/22/78	SAMOA TEST	3 HR 47 MIN		
2/22/78	DISP	4 HR	4 HR	
2/22/78	DISP	1 HR	1 HR	
2/23/78	ALFE	4 HR 16 MIN	3 HR 30 MIN	20 SEC. (OD videotape machine failure)
2/23/78	DISP	4 HR	4 HR	
2/23/78	ALVA	1 HR 50 MIN	1 HR 15 MIN	
2/23/78	VA MON*	2 HR 29 MIN	1 HR 59 MIN	
2/23/78	DISP	1 HR	1 HR	
2/24/78	MSHC	1 HR 52 MIN	1 HR 30 MIN	
2/24/78	VA MON*	1 HR 25 MIN	1 HR 1 MIN	
2/24/78	ALFE	2 HR 44 MIN	1 HR 58 MIN	
2/24/78	ALFE	4 HR 48 MIN	4 HR 1 MIN	
2/24/78	DISP	1 HR	1 HR	
2/25/78	ALFE	3 HR 9 MIN	2 HR 29 MIN	
2/25/78	ALFE	8 HR 9 MIN	7 HR 29 MIN	
2/26/78	ALFE	4 HR 10 MIN	3 HR 25 MIN	
2/27/78	ALFE	4 HR 13 MIN	3 HR 29 MIN	
2/27/78	DISP	1 HR	1 HR	
2/27/78	SAMFE	2 HR 46 MIN	1 HR 59 MIN	
2/27/78	DISP	4 HR	4 HR	
2/28/78	ALFE	4 HR 10 MIN	3 HR 29 MIN	
2/28/78	DISP	4 HR	4 HR	
2/28/78	SAMFE	3 HR	1 HR 58 MIN	
2/28/78	DISP	1 HR	1 HR	
3/1/78	MSHC	2 HR 18 MIN	1 HR 29 MIN	
3/1/78	VA TEST*	1 HR 40 MIN		
3/1/78	ALFE	4 HR	1 HR 58 MIN	
3/1/78	DISP	4 HR	4 HR	
3/1/78	SAMFE	3 HR 42 MIN	2 HR 59 MIN	
3/1/78	DISP	1 HR	1 HR	

OPERATING TIMES AND OUTAGES

(GMT) DATE	MODE	OPERATING TIMES		OUTAGES
		NCC/DUT	ON-AIR	
3/2/78	ALFE	4 HR 15 MIN	3 HR 28 MIN	
3/2/78	SAMFE	2 HR 39 MIN	1 HR 59 MIN	
3/2/78	ALVA	1 HR 45 MIN	1 HR 15 MIN	
3/2/78	VA MON*	2 HR	1 HR 29 MIN	
3/2/78	DISP	1 HR	1 HR	
3/2/78	DISP	4 HR	4 HR	
3/3/78	MSHC	1 HR 24 MIN	1 HR 4 MIN	
3/3/78	..ALFE	2 HR 49 MIN	1 HR 58 MIN	
3/3/78	ALFE	5 HR 30 MIN	5 HR	
3/3/78	DISP	1 HR	1 HR	
3/4/78	SAMFE	1 HR 41 MIN	1 HR	
3/4/78	ALFE	3 HR 7 MIN	2 HR 29 MIN	
3/4/78	ALFE	8 HR 3 MIN	7 HR 23 MIN	
3/5/78	ALFE	4 HR 19 MIN	3 HR 36 MIN	
3/6/78	ALFE	4 HR	3 HR 29 MIN	
3/6/78	SAMFE	2 HR 30 MIN	1 HR 59 MIN	
3/6/78	DISP	1 HR	1 HR	
3/7/78	ALFE	4 HR 9 MIN	3 HR 29 MIN	
3/7/78	SAMFE	2 HR 33 MIN	1 HR 59 MIN	
3/7/78	DISP	1 HR	1 HR	
3/8/78	MSHC	1 HR 52 MIN	1 HR 30 MIN	
3/8/78	ALFE	2 HR 42 MIN	1 HR 56 MIN	
3/8/78	VA TEST*	19 MIN		
3/8/78	SAMFE	3 HR 5 MIN	2 HR 58 MIN	
3/8/78	DISP	1 HR	1 HR	
3/9/78	ALFE	3 HR 56 MIN	3 HR 30 MIN	
3/9/78	DISP	4 HR	4 HR	
3/9/78	SAMFE	2 HR 32 MIN	2 HR	
3/9/78	ALVA	13 MIN		No RCVR. at Anchorage. ALVA terminated. 1 HR 45 MIN
3/9/78	VA MON*	2 HR 31 MIN	1 HR 45 MIN	
3/9/78	DISP	1 HR	1 HR	
3/10/78	ALFE	2 HR 51 MIN	1 HR 55 MIN	
3/10/78	ALFE	4 HR 33 MIN	4 HR	

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OPERATING TIMES AND OUTAGES

(GMT) DATE	MODE	OPERATING TIMES		OUTAGES
		NCC/DUT	ON-AIR	
3/10/78	DISP	1 HR	1 HR	
3/11/78	SAMFE	1 HR 12 MIN	56 MIN	
3/11/78	ALFE	3 HR 36 MIN	2 HR 29 MIN	
3/11/78	ALFE	8 HR 12 MIN	7 HR 30 MIN	
3/12/78	ALFE	3 HR 47 MIN	2 HR 59 MIN	
3/13/78	ALFE	3 HR 51 MIN	3 HR 29 MIN	
3/13/78	SAMFE	2 HR 44 MIN	1 HR 59 MIN	
3/14/78	ALFE	4 HR 18 MIN	3 HR 29 MIN	10 SEC. (Switcher dropped out) static discharge
3/14/78	DISP	4 HR	4 HR	
3/14/78	SAMFE	2 HR 31 MIN	1 HR 58 MIN	
3/14/78	VA MON*	2 HR 30 MIN	1 HR 59 MIN	30 SEC. (VA Mobile TMTR down.)
3/15/78	ALFE	2 HR 39 MIN	2 HR 1 MIN	
3/15/78	SAMFE	3 HR 21 MIN	2 HR 59 MIN	
3/16/78	ALFE	3 HR 59 MIN	3 HR 43 MIN	
3/16/78	DISP	3 HR 55 MIN	3 HR 55 MIN	
3/16/78	SAMFE	1 HR 36 MIN	1 HR 28 MIN	
3/16/78	VA MON*	2 HR 21 MIN	1 HR 48 MIN	1 MIN 16 SEC. (VA Mobile TMTR.)
3/17/78	ALFE	2 HR 32 MIN	1 HR 56 MIN	
3/17/78	ALFE	4 HR 30 MIN	4 HR	
3/18/78	SAMFE	1 HR 59 MIN	1 HR 25 MIN	
3/18/78	ALFE	2 HR 53 MIN	2 HR 29 MIN	
3/18/78	ALFE	8 HR 8 MIN	7 HR 34 MIN	
3/19/78	ALFE	4 HR 2 MIN	3 HR 29 MIN	
3/19/78	ALFE	5 HR 30 MIN	4 HR 30 MIN	(One continuous feed: Marathon)
3/20/78	ALFE	7 HR 41 MIN	7 HR 40 MIN	
3/20/78	SAMFE	2 HR 23 MIN	1 HR 59 MIN	
3/21/78	ALFE	4 HR 5 MIN	3 HR 29 MIN	
3/21/78	DISP	3 HR 55 MIN	3 HR 55 MIN	
3/21/78	VA MON*	2 HR 33 MIN	1 HR 56 MIN	22 SEC. (VA mobile TMTR down.)
3/21/78	SAMFE	2 HR 40 MIN	1 HR 59 MIN	
3/22/78	ALFE	2 HR 33 MIN	1 HR 58 MIN	
3/22/78	SAMFE	3 HR 39 MIN	2 HR 58 MIN	
3/23/78	ALFE	4 HR 19 MIN	3 HR 37 MIN	3 MIN (NCC Switching error).
3/23/78	DISP	3 HR 55 MIN	3 HR 55 MIN	

